IL700
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GENERAL INSTRUCTIONS

international light

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INSTRUCTION MANUAL for the

IL700 RESEARCH RADIOMETER and PHOTOMETER SERIES

(including IL710, IL730, IL740, IL770)

INTERNATIONAL LIGHT, INC.
DEXTER INDUSTRIAL GREEN
NEWBURYPORT, MA. 01950
(617)465-5923

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1. INTRODUCTION: The IL700 series of Radiometers and Photometers can read out directly in any predetermined optical units applicable to energy or power measurement. The IL700 series also features both pulsed and continuous measurement capability. The pulsed measurements can be made accurately with pulse durations as fast as 5 nanoseconds. Continuous measurements of light power can be made in the spectral band from 220nm to 1100nm with the appropriate detector. Power levels as low as $1x10^{-16}$ watts/cm^2 or $1x10^{-9}$ foot-candles can be monitored with suitable accessory options. Optical Radiation Hazards can also be monitored with use of the Actinic input optics attachment. The IL700 is both AC and battery operable for full field portability. Fiber optics and spectroradiometric options are directly compatable with all IL700 instrumentation for a full range of measurement situations.

2. FRONT and REAR PANEL CONTROLS

2.1 Front Panel

2.11 Digital Readout: The digital readout consists of a 3 1/2 digit solid state L.E.D. display capable of 400% over-ranging. The exponent to the right of the readout is indicated in scientific notation in powers of ten. The readings can be in absolute or relative units as determined by the Sensitivity Factor as explained in 2.12. The sampling rate is set at two samples per second. The readout is legible at distances of over 10' from the instrument.

2.12 Sensitivity Factor: This control enables the operator to dial in any precalibrated value (usually supplied with the calibration sheet) of optical units, on the front panel thumbwheel switch. An important feature of this control is it's ability to allow the operator to measure in any optical units of measurement. Instructions on the use of the Sensitivity Factor are explained in section 4.0.

2.13 Range: The range switch and sensitivity switch (thumbwheel switch) permit eight (8) decades of input sensitivity coverage. The 400% over-ranging provides 0.025% resolution full scale (.25% on one-tenth of full scale) which is a 4 to 1 overlap on ranges while maintaining greater than 1% readout capability. The absolute numbers depend upon the "sensitivity factor" which is dialed into the front panel. For any one factor the instrument will span seven (7) decades change in input (8 decades at a sacrifice or resolution on the most sensitive range.) The factors that may be entered can range from 1.000×10^{-9} to $9.999 \times 10^{+4}$ or 15 decades. This number becomes a divisor with the input current being the dividend. The readout can therefore, range anywhere from 0.40×10^{-15} to 40.00×10^{4} which is over a range of 21 decades depending upon the factor employed for any one application.

2.14 Suppression: This consists of two current cancelling controls. A six range coarse switch, plus a fine ten turn potentiometer control. This is utilized for cancelling out any existing dark current in the detector head itself when the detector is shielded from any light. The controls can also be used to null out any existing ambient light. This allows the operator to make accurate readings even in full room light.

2.15 Function: The function switch is the main control switch for the instrument. In the D.C. mode it allows the Digital Readout to measure steady or continuous irradiance or illuminance. In the hold position, the reading is stored on the display for ease of reading. The Integrate position changes the mode to a pulsed measurement capability. Readings are then in units of energy (watt-seconds, joules or foot-candle-seconds, etc.) depending upon the calibration supplied. The reset feature restores the display back to a zero reading. The D.C. fast position allows for a more rapid response at the chart recorder output terminals and on the Digital Readout.

2.16 On - Off Charge: This is the master power switch for the instrument. The "ON" light indicates satisfactory operating conditions (A.C. or Battery). It will blink due to any overloads or if the battery voltage is low. If the unit is plugged into a suitable source of 115 or 230 volts A.C., the battery will receive a charge in both the "on" and "charge" positions. In "on" it receives a trickle charge to just keep the battery fresh. In the "charge" position it will recharge a dead battery in 14 hours. It is not good practice to leave the instrument in the charge position for many days at a time, since it will shorten the life of the battery. If the battery should fail, the instrument will function on A.C. independently or it may be powered by an auxiliary D.C. source from 10 to 28 VDC applied to the accessory jack (positive voltage to pin 15 - negative to ground pin 9).

2.16 (continued) - The system automatically switches to battery power in the event of power failure or if disconnected from the source of A.C.

2.2 Rear Panel

2.21 Sensor Input: This connector receives the signal generated by the photosensor measuring the light. It also supplies power to bias the sensors for operation. Shielding is accomplished by a special pin configuration to eliminate unwanted electrical noise pickup. The pin numbering is shown in Section 7.

2.22 Recorder Output: A chart recorder can be used with the IL700 to enable the operator to perform either dc or continuous spectroradiometric scans of the source under investigation. Three full scale output voltages are available; 10 millivolts, 100 millivolts and 1000 millivolts. Standard female "banana" jacks are provided centered on 3/4" spacing.

2.23 Accessory Output: This connector provides for factory operational tests and calibration functions. It also can provide a BCD output for computer interfacing applications. This feature is available as an option and International Light should be consulted for further information. The Accessory Output also can accept dc supply voltages from 10 - 28 VDC for operation in remote areas from aircraft or vehicle power. This is especially helpful in military applications.

2.24 AC Input: 115VAC/230VAC - 50 - 60Hz.

3. PRECAUTIONS: Since the instrument is made to accept several different types of detectors, it has been designed to measure current over a range greater than the output of certain detectors. For example vacuum photodiodes should not be operated on the two Red scales "A" and "B" since the current level is too great for linear operation. Photomultipliers and solid state detectors are capable of greater current and may be operated on the high current ranges but may have too much dark current or noise for the

3. PRECAUTIONS (cont.): very sensitive ranges. Another precaution is to avoid exposing a photomultiplier to bright illumination when power is applied. It is possible to damage the sensitive cathode or conduct excessive current.

4. OPERATION: The IL700 Radiometer/Photometer is capable of reading any optical unit of measurement in optical power (watts), optical irradiance (W/cm^2), or optical energy (joules) as well as the photometric equivalents. (Lumen, lux, and lux-sec) The spectral range is unlimited and only dependent upon the choice of detector. For most applications, International Light supplies detectors to cover the range from 200 nanometers to 1100 nanometers. All photopic (eye response) measurements will normally fall within the 400 to 700 nanometers range.

4.1 Steady State Measurements: To take a direct reading, the following simple procedure is followed. Connect the detector input to the rear panel jack. Find the sensitivity factor for the detector filter combination on the calibration sheet. Using the sensitivity control thumbwheel switch and exponent knob (directly to the right) dial in this sensitivity factor. Change the range switch until a reading between 1.00 and 40.00 is obtained on the digital panel meter. The readout now indicates the measurement in direct units, including the x10 exponent in scientific notation. (The units are determined by the calibration originally requested.) No further use of this thumbwheel switch is required, unless a change in detector heads is performed or a new calibration desired. (Recalibration should be performed once a year.)

4.2 Average Measurements: If the light source is flickering, or modulated such as a lamp flashing five times a second, or an ac powered flourescent lamp which is turning on and off 120 times per second, it is necessary and essential to obtain the average reading. The IL700 Series instruments provide this

4.2 Average Measurements (cont.): capability in both the D.C. and D.C. fast function modes, with filtering time constants of 1 second and 100 milliseconds respectively. Even pulses of light with a duty cycle of only 10% will not saturate the amplifier and will filter the ripple component to less than 1% for frequencies as low as 10Hz due to the combined 1 second time constant, the secondary amplifier filtering, and digital panel meter filtering.

4.3 Flash Measurements: The integration capability of the system is built in so that the calibration remains the same with the addition of "seconds" added to the readout units. In other words (uW)(cm^{-2}) becomes (uW)(sec)(cm^{-2}). Since a (uW)(sec) is equal to a uJ, it can be written (uJ)(cm^2) and so on. The control functions used for flash measurements are "Reset", "Integrate", and "Hold" in that order. "Reset" returns the system to zero. "Integrate" performs a time integral of the input while the function switch remains in this position. It also closes contacts on the rear panel called "sync" which can be used to initiate the start of the flash lamp. "Hold" disconnects the input, waits for the final reading from the analog circuitry and then stores this answer in memory for display on the front panel.

5. USE AS A TRANSIMISSOMETER OR DENSITOMETER: The IL700 can be easily programmed to perform as a densitometer with exceptional accuracy and repeatability. To take a transmission reading, follow this procedure:

5.1 Step I: Physically mount a steady light source and detector which will provide a desirable optical path for the transmission measurements.

5.2 Step II: Select a range and sensitivity factor to obtain a reading of 1.00 (100%) on the meter.

5.3 Step III: Insert the unknown filter in the optical path and read transmission directly.

6. USE AS A PICOAMMETER: The IL700 can measure negative currents directly by dialing in a sensitivity factor of $1.00x10^{0}$ and connecting to the unknown source (via the accessory current input cable C-10). Currents as low as $0.10x10^{-11}$ and as high as $40.00x10^{-5}$ will be indicated as a direct digital readout.

7. CALIBRATION AND MAINTENANCE

7.1 Electronic Calibration: Please consult factory for electronic calibration procedure.

7.2 Optical Calibration: The detector heads should be recalibrated at least onee a year. Return detector only to factory for recalibration. All radiometric and photometric calibrations are traceable to the National Bureau of Standards in Washington, DC.

7.3 Maintenance: Unless subjected to extreme conditions of corrosion or temperature, the Model IL700 meter should require little maintenance and provide stable performance. Lens paper should be used in cleaning the optical input on sensor assemblies to avoid scratching. International Light, Inc. offers its services to perform any modifications that might be desired for special applications. Replacement parts are available from stock and may be ordered directly from the manufacturer.

8. WARRANTY: The equipment you have purchased from International Light, Inc. has been expertly designed and was carefully tested and inspected before being shipped. If properly operated in accordance with the instructions furnished it will provide you with excellent service. The equipment is warranted for a period of twelve (12) months from date of purchase to be free of defects in material or workmanship. This warranty does not apply to damage resulting from accident, alteration, abuse, loss of parts or repair

8. WARRANTY (con't): by other than International Light, Inc. The equipment will be repaired or replaced, at our option, without charge to the owner for parts or labor incurred in such repair. This warranty shall not apply unless the equipment is returned for our examination with all transportation charges prepaid to International Light, Inc., Dexter Industrial Green, Newburyport, MA 01950. International Light, Inc. has no other obligation or liability in connection with said equipment.

CONVERSION TABLES

Radiometric Identities

Quantity	MKS Unit
Radiant Intensity	watt/W (W = unit solid angle)
Radiant Flux	watt
Radiant Energy	joule = watt-sec. = 10^7 ergs
Radiant Emittance	watt/m^2
Radiance	watt/(W - m^2)
Irradiance	watt/m^2

Luminance

Quantity	Multiplied By:	Equals
candles/cm^2	10,000.00	candles/meter^2
candles/cm^2	3,142.00	millilamberts
candles/cm^2	3.142	lamberts
lamberts	3,183.00	candles/meter^2
candles/foot^2	10.764	candles/meter^2
candles/foot^2	3.382	millilamberts
millilamberts	3.183	candles/meter^2
candles/meter^2	0.0929	candles/foot^2

Photometric Identities

QUANTITY	UNIT
Luminous Intensity	candle
Luminous Flux	lumen
Luminous Energy	lumen-sec. = (talbot)
Luminous Emittance	lumen/m^2
Luminance	candle/m^2
	candle/cm^2 (stilb)
	(lambert for perfect diffusers)

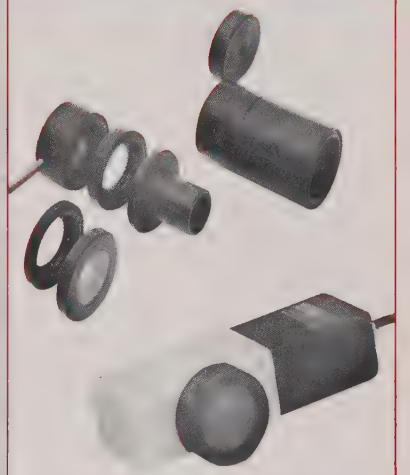
Photometric Conversion Factors

Illumination

QUANTITY	MULTIPLIED BY:	EQUALS
lumens/$meter^2$	.0929	lumens/$foot^2$
(meter-candle, lux)		
Milliphot	10.0	lumens/$meter^2$
Milliphot	0.929	lumens/$foot^2$
lumens/$foot^2$	10.764	lumens/$meter^2$
(foot-candles)		
lumens/$centimeter^2$	10,000	lumens/$meter^2$
(phot)		
foot-candle	1.0	lumens/sq. ft.

data sheet **IL700**

IL700 RESEARCH RADIOMETER
For All Types of Light Measurement



Some of the many optional accessories: detectors, filters, input optics

FEATURES:

- **Ultraviolet, visible** and **infrared** measurement capability (190 to 1100nm) with appropriate interchangeable modular sensor assemblies.
- **Sensitivity** from 1.0×10^{-15} watts/cm² with photomultiplier sensor assembly to over 1 watt/cm².
- **Programmable input** allows direct readout in any optical unit required.
- **Integration mode** for pulses as fast as six microseconds and as slow as five minutes.
- **Portable** with self-contained rechargeable nickel cadmium battery or ac operation.
- **Suppression control** to suppress dark current and/or unwanted ambient light.
- **Chart recorder outputs** at three common voltage levels.
- **Digital meter readout** with a 3½ digit display capable of 400% overranging.
- **Picoammeter capability** for accurate current measurements.

DESCRIPTION

The IL700 RESEARCH RADIOMETER is the advanced readout unit for the International Light series of modular optical instrumentation. The most advanced field effect transistor design and plug-in printed circuitry is employed in the IL700. The available modular optical instrumentation includes a wide variety of electro-optical sensor assemblies for all types of radiometric measurements throughout the ultraviolet, visible and infrared. The IL700 with the proper component combinations provides a measurement capability for the extremes of light intensity encountered in most research and industrial applications. Consult the appropriate data sheets for information on the specific capabilities of these component devices with the IL700.

The PROGRAMMABLE INPUT feature makes the IL700 Research Radiometer very adaptable and easy to use. The meter is read *directly* in the optical units required (milliwatts cm^{-2}, microwatts · cm^{-2} · nm^{-1}, watts · $ster^{-1}$ · cm^{-2}, etc.) by setting the proper sensitivity (calibration) factor for the given sensor assembly.

international light INC. DEXTER INDUSTRIAL GREEN, NEWBURYPORT, MASS 01950 U S A
TEL. 617-465-5923 TELEX 94-7135

Figure 1 shows a sensitivity factor being dialed in with the digital thumbwheel switch on the IL700. No conversion calculations are required. The sensitivity factor for a given sensor assembly is determined at International Light by measuring the output signal current for a known input in the optical units desired. For example, a 1×10^{-9} watt · cm^{-2} input irradiance produces a signal current of 1×10^{-6} µamp in a given sensor. The sensitivity factor setting is 1×10^{3} amps/(watt · cm^{-2}) which is automatically divided into the meter's input current to yield a reading directly in watts · cm^{-2}. Filters or complete detector assemblies can be interchanged while retaining the direct readout capability. Furthermore, the programmable input feature allows the IL700 to read percent transmission directly for transmission measurements and also allows it to be used as a picoammeter. Direct indication of the exponent is clearly displayed for all readings, reducing the possibility of error. The exponent on the readout is illuminated to facilitate darkroom operation.

The IL700 Research Radiometer can operate in either of two modes (1) a DC MODE and (2) an INTEGRATION MODE. The dc mode is for average measurements of continuous or slowly flashing light sources. The integrate mode is used to measure the energy from pulsed light sources as short as six microseconds or as long as five minutes. In this mode synchronization is provided by a contact closure that can be used to trigger the light source.

The sensor assemblies for use with the IL700 can be provided with an ABSOLUTE CALIBRATION traceable to the National Bureau of Standards in Washington, D.C.

IL700 SPECIFICATIONS

RADIOMETRIC

Sensitivity: From 1×10^{-15} watts/cm^2 with a PM270D (S-20 photomultiplier at room temperature) to over 1 watt/cm^2.

Spectral Range: From 190 nanometers to 1100 nanometers. S-1, S-5, S-20, GaAs, UV solar blind and silicon response available.

FRONT PANEL CONTROLS

Sensitivity Factor: A four digit thumbwheel switch plus exponent switch provides input for sensitivity factors from 1.000×10^{-11} to 9.999×10^{2} (14 decades) for direct readout in any radiometric unit.

Range: A seven position switch provides a range of seven decades. A 3½ digit display with an illuminated power of 10 exponent is provided for readout. The range switch combined with the sensitivity factor switch provide for more than 21 decades of direct readout.

Function: A main control switch selects one of the instruments two primary functions (1) D.C. or (2) INTEGRATE.

D.C.Operation: The D.C. position is for normal operation with a response of 1 second. The D.C. FAST position allows for more rapid response (100 milliseconds) at the chart recorder output and on the digital meter.

Pulse Integration: In the INTEGRATE position, pulse durations from 6×10^{-6} seconds to 5 minutes can be integrated. The range is capable of over 8 decades of overlapping charge measurement from 1×10^{-11} coulombs to 4×10^{-3} coulombs. The full scale charge measurement accuracy is ± 0.3% from 1 µC to 2 mC, ± 0.6% from 1 nC to 1 µC and ± 1% below 1 nC.

Suppression: Six ranges plus a 10 turn fine potentiometer control for suppression of 0 to 1 µamp of dark current and/or ambient illumination.

Battery Charge Indicator: Indicator light begins to blink when battery voltage drops below operating level.

REAR PANEL (see Fig. 2 below)

Recorder Output: Three separate terminals for full scale output voltages of 10 mv, 100 mv and 1 volt with output impedances of 24Ω, 231Ω and 4 Ω respectively. Current limited.100 msec response.

Power: External 95-135 or 190-270 VAC at 50 to 60 Hz or auxilary 10-28 VDC (Accessory Output). Internal rechargeable nickel cadmium battery for three hours of continuous operation. Regulation on all internal voltages.

Sensor Input: Regulated sensor bias voltages of -170 V and -12 V.

Accessory Output: Can provide binary output for computer interfacing. Consult factory.

ELECTRICAL

Input Current: Over 8 decades of overlapping current measurement from 1×10^{-11} to 4×10^{-3} amps.

Current Measurement Accuracy: Full scale accuracy of ± 0.2% from 1 µA to 2 mA, ± 0.5% from 1 nA to 1µA and ± 1% below 1 nA.

Input Impedance: Virtual ground (summing node of operational amplifier).

MECHANICAL

Size: 11″ (27.9cm) wide x 5″ (12.7cm) high x 7″ (17.8cm) deep.

Weight: 15 lbs. (6.8kg)

Color: Ebony with oyster white panel.

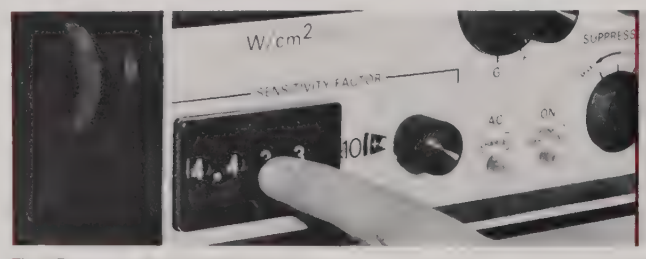


Fig. 1 Programmable Sensitivity Factor

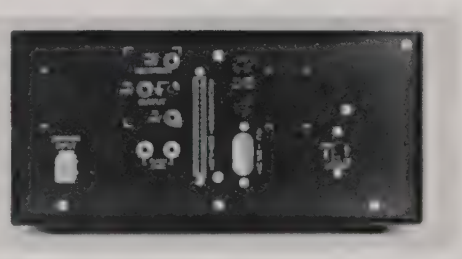
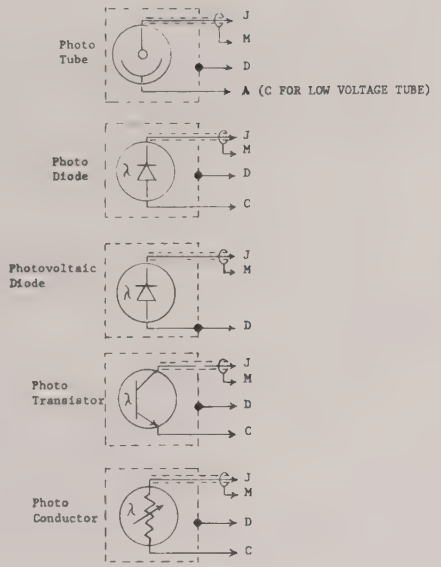
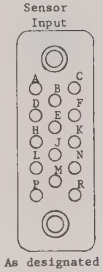


Fig. 2 Back panel of IL700 Radiometer

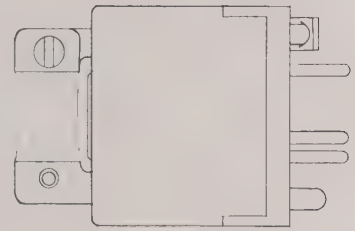
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



A - (-160V)
B - (+12V)
C - (-12V)
D - Ground
J - Sensor Input
E,H,K,L,M,N - Signal Ground
F,P,R - Not used



As designated on the back panel of the IL700 Series



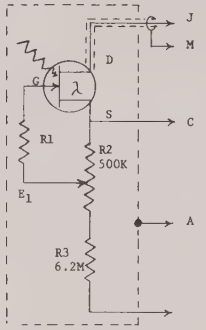
Winchester Plug

Connector - MRA 14P-G
Hood - MRE 14H
Pins - 100-0620S

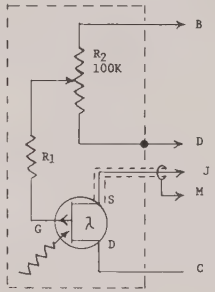
E1 99% of pinch-off voltage(V_p). Cancel remaining bias current with cancel current (no light)

R1 = 100K to 10 Meg depending on desired sensitivity. The higher the resistance the greater the sensitivity.

The above circuits are designed to operate with N-channel and P-channel Photo Field Effect Transistors whose pinch-off voltages are less than 10 volts, and 9 volts respectively. Place the sensor in darkness and adjust pot R2 until the device conducts less than 100 nanoamperes. Now cancel this dark conduction by selecting the appropriate cancel current to return the meter to zero. Now any additional light will be recorded directly.



N - Channel



P - Channel

Method of using Photo-Fet transistors

ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
				LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
CAPACITOR VALUES ARE IN μF
RESISTOR VALUES ARE IN OHMS
DIMENSIONS ARE IN INCHES
TOLERANCE ON
DECIMALS FRAC. ANGLES
.XX ± ± ±
.XXX ± - -
CONCENTRICITY .005 TIR
ALL SHARP EDGES .01R MIN
ALL MACH. SURFACES 125

CONTRACT NO

		DATE
MFG. APPD		
ENGR APPD		
DRAWN	C Brown	5/6/71

MATERIAL:

FINISH:

NEXT ASSY.	USED ON
APPLICATION	

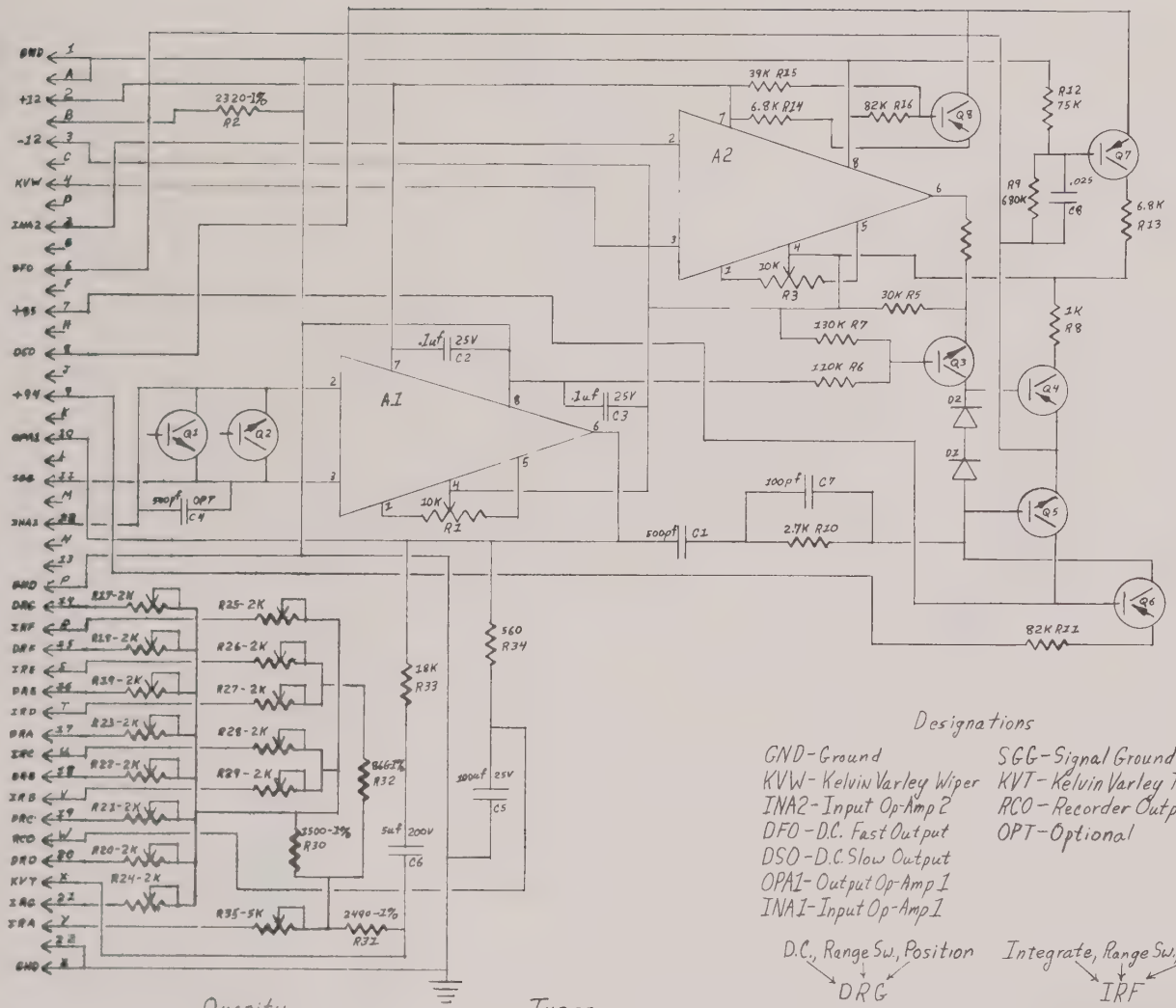
International light INC.
12 UNICORN STREET NEWBURYPORT MASSACHUSETTS 01950

Wiring of photo sensitive devices with the IL700s

SIZE	DRAWING NO.	REV.
C	1602	

SCALE | DO NOT SCALE THIS DRAWING | SHEET

ZONE	LTR	DESCRIPTION	DATE	APPROVED



Designations

GND - Ground
KVW - Kelvin Varley Wiper
INA2 - Input Op-Amp 2
DFO - D.C. Fast Output
DSO - D.C. Slow Output
OPA1 - Output Op-Amp 1
INA1 - Input Op-Amp 1
SGG - Signal Ground
KVT - Kelvin Varley Top
RCO - Recorder Output
OPT - Optional

D.C., Range Sw., Position → DRG

Integrate, Range Sw., Position → IRF

Quanity

A1-2
Q1-8
R1-35
D1-2
C1-8

Types

Q1 and Q2 are 2N2924
Q7 and Q8 are 2N4061
Q4 and Q6 are MPSA93
Q3 and Q5 are MPSA43
A1 - AD523K
A2 - AD741K
D1 and D2 are 1N914

ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
			LIST OF MATERIALS OR PARTS LIST	

UNLESS OTHERWISE SPECIFIED
CAPACITOR VALUES ARE IN μF
RESISTOR VALUES ARE IN OHMS
DIMENSIONS ARE IN INCHES
TOLERANCE ON
DECIMALS FRAC ANGLES
.XX ± ' °
.XXX ±
CONCENTRICITY .005 TIR
ALL SHARP EDGES .018 MIN.
ALL MACH SURFACES 125

CONTRACT NO

MFG. APPD		DATE
ENGR APPD		DATE
DRAWN	C Brown	DATE

MATERIAL:

FINISH:

SCALE

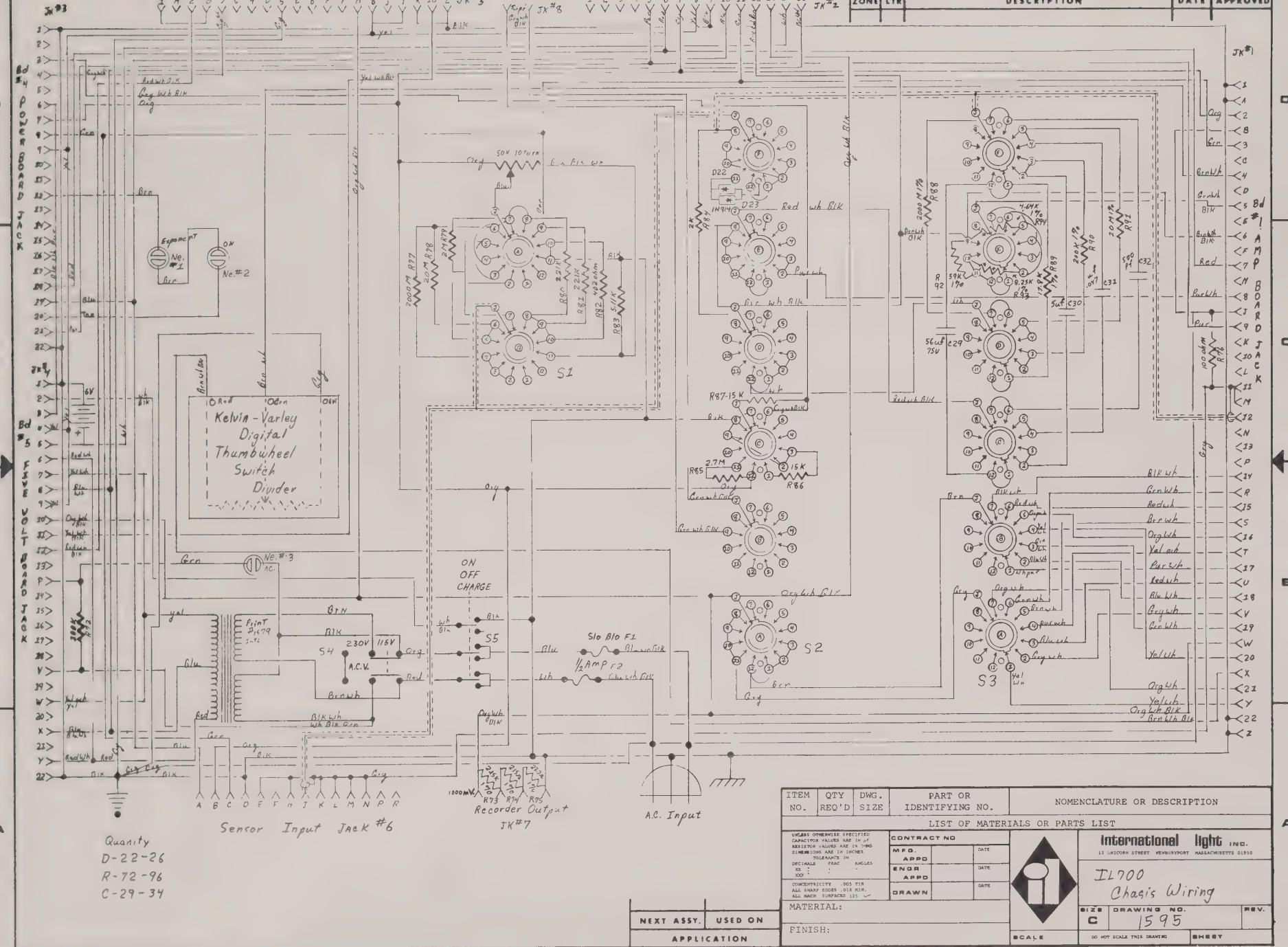
NEXT ASSY.	USED ON
APPLICATION	

International light INC.
12 UNICORN STREET WENBURYPORT MASSACHUSETTS 01950

IL700 Amp Board
Schematic Bd #1

SIZE	DRAWING NO.	REV
C	1598	

DO NOT SCALE THIS DRAWING SHEET



ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
CAPACITOR VALUES ARE IN μf
RESISTOR VALUES ARE IN OHMS
DIMENSIONS ARE IN INCHES
TOLERANCE ON
DECIMALS FRAC ANGLES
XX ± ± -
XXX ± - -
CONCENTRICITY .005 TIR
ALL SHARP EDGES .015 MIN.
ALL MACH SURFACES 125

CONTRACT NO

		DATE
MFG. APPD		
ENGR APPD		
DRAWN		

MATERIAL:

FINISH:

NEXT ASSY.	USED ON
APPLICATION	

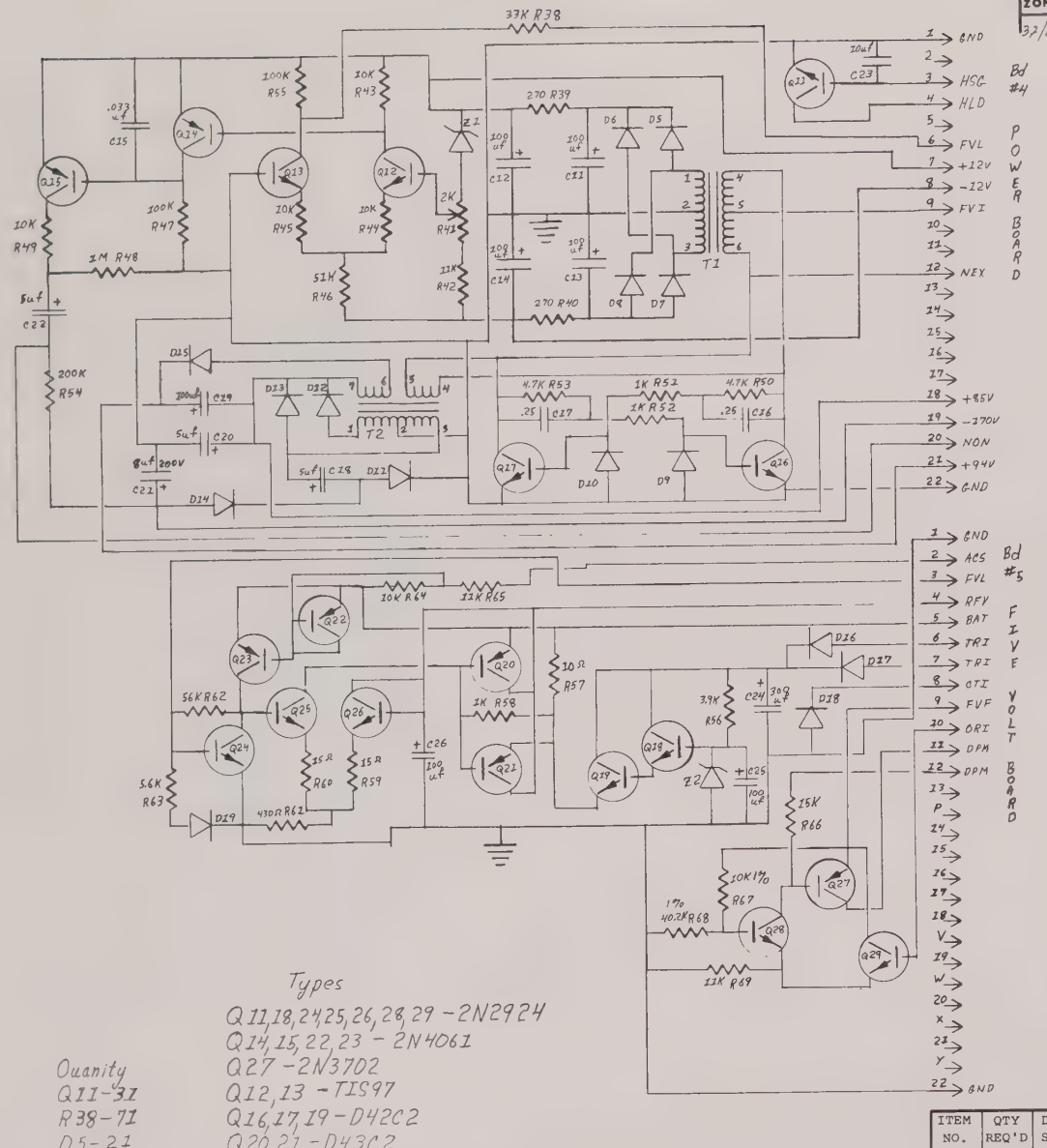
International light INC.
12 UNICORN STREET NEWBURYPORT MASSACHUSETTS 01950

IL700
Chassis Wiring

SIZE	DRAWING NO.	REV.
C	1595	

SCALE — DO NOT SCALE THIS DRAWING — SHEET

ZONE	LTR	DESCRIPTION	DATE	APPROVED
37/6	A	5.6ohm changed to a 10 ohm	9April74	C Brown



Designations

GND - Ground
HSG - Hold Signal
HLD - Hold Line to DPM
FVL - Five Volt Loop
FVI - Five Volt In
NEX - Neon Exponent light
NON - Neon On light
ACS - A.C. Switch
RFV - Regulated Five Volts
BAT - Battery
TRI - Transformer In
CTI - Center-tap Transformer In
FVF - Five Volt Feed
ORI - Over Range Indicator
DPM - Digital Panel Meter

Types

Q11,18,24,25,26,28,29 - 2N2924
Q14,15,22,23 - 2N4061
Q27 - 2N3702
Q12,13 - TIS97
Q16,17,19 - D42C2
Q20,21 - D43C2
D11→18 - 1N3194
D5→10 - 1N914
D19 - 1N270
Z1 - 1N5241B
Z2 - 1N5239B

T1 - TAPC19
T2 - T26X

Quanity
Q11-31
R38-71
D5-21
C11-28
Z1-4

ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
			LIST OF MATERIALS OR PARTS LIST	

UNLESS OTHERWISE SPECIFIED
CAPACITOR VALUES ARE IN μf
RESISTOR VALUES ARE IN OHMS
DIMENSIONS ARE IN INCHES
TOLERANCE ON
DECIMALS FRAC. ANGLES
.XX ± ' °
.XXX ±
CONCENTRICITY .005 TIR
ALL SHARP EDGES .018 MIN.
ALL MACH SURFACES 125

CONTRACT NO

		DATE
MFG. APPO		
ENGR APPO		
DRAWN	C. Brown	11Jan74

MATERIAL:

FINISH:

NEXT ASSY. | USED ON
APPLICATION

SCALE

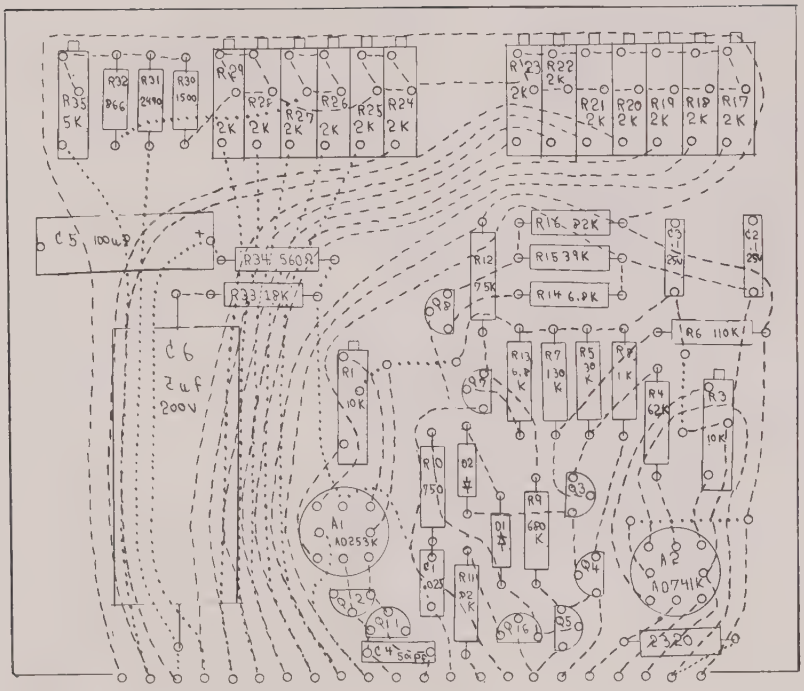
International light INC.
12 UNICORN STREET NEWBURYPORT MASSACHUSETTS 01950

IL700 5V and Power Bd Schematics

SIZE C | DRAWING NO. 1600 | REV. A

DO NOT SCALE THIS DRAWING | SHEET

Q1 and Q2 are 2N2924
Q7 and Q8 are 2N4061
Q4 and Q6 are MPSA93
Q3 and Q5 are MPSA43
A-1 AD523K
A-2 AD741K



ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
LIST OF MATERIALS OR PARTS LIST				

UNLESS OTHERWISE SPECIFIED CAPACITOR VALUES ARE IN PF RESISTOR VALUES ARE IN OHMS DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS .XX ±.01 .XXX ±.001 FRAC. ±1/64 ANGLES ±1°

CONCENTRICITY .005 TIR
ALL SHARP EDGES .015 MIN.
ALL MACH. SURFACES 125 ✓

CONTRACT NO

		DATE
MFG. APPD		
ENGR APPD		
DRAWN	CBrown	29Oct73

MATERIAL: See Above

FINISH:

SCALE 2:1

International light INC.
12 UNICORN STREET, NEWBURYPORT, MASSACHUSETTS 01950

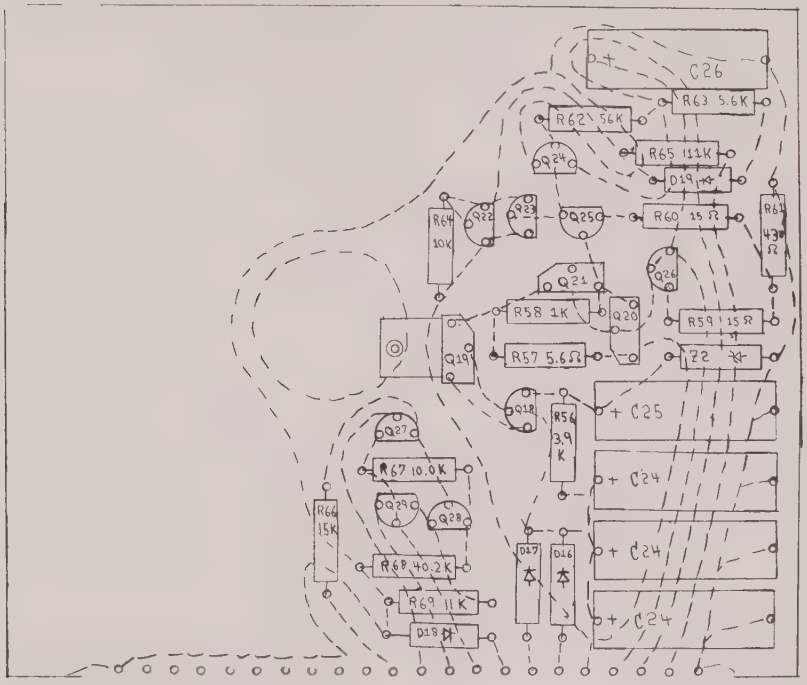
IL700 Amp BD
Artwork

SIZE	DRAWING NO.	REV.
B	1578	A

SCALE | DO NOT SCALE THIS DRAWING | SHEET

Q18,24-26,28,29 – 2N2924
Q22,23 – 2N4061
Q19 – D42C2
Q20,21 – D43C2
Q27 – 2N3702

C1-3, 100 uf 35V
D1-3, 1N3194
D4, 1N270



ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
LIST OF MATERIALS OR PARTS LIST				

UNLESS OTHERWISE SPECIFIED
CAPACITOR VALUES ARE IN UF
RESISTOR VALUES ARE IN OHMS
DIMENSIONS ARE IN INCHES
TOLERANCE ON
DECIMALS ± FRAC ± ANGLES ±
.XX 1/64
.XXX
CONCENTRICITY .005 TIR
ALL SHARP EDGES .010 MIN.
ALL MACH SURFACES 125

CONTRACT NO

MFG. & ENG		DATE
ENGR APPD		DATE
DRAWN		DATE

MATERIAL: See Above
FINISH: See Above

International light INC.
12 UNICORN STREET NEWBURYPORT MASSACHUSETTS 01950

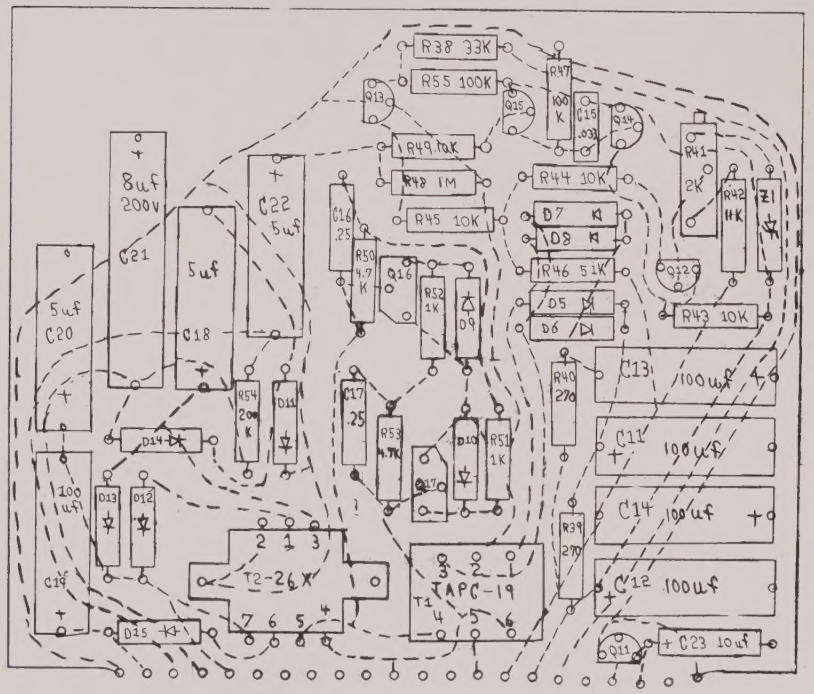
IL 700
5V Board #5
Layout

SIZE	DRAWING NO.	REV.
B	1574	A

SCALE 2:1
DO NOT SCALE THIS DRAWING
SHEET

Q12and Q13 TIS 97
Q14and Q15 2N4061
Q16and Q17 D42C2
C11-14,19 -100uf 35V
C18,20,22-5uf 150V
C21,8uf 200V

C16,17-.25uf
C15 .033 uf
D11-15,1N3194
D5-10,1N914
Z1, 1N5241B



ITEM NO.	QTY REQ'D	DWG. SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
LIST OF MATERIALS OR PARTS LIST				

UNLESS OTHERWISE SPECIFIED
CAPACITOR VALUES ARE IN μF
RESISTOR VALUES ARE IN OHMS
DIMENSIONS ARE IN INCHES
TOLERANCE ON
DECIMALS FRAC. ANGLES
.XX ± ±1/64 ±
.XXX ±
CONCENTRICITY .005 TIR
ALL SHARP EDGES .010 MIN.
ALL MACH. SURFACES 125

CONTRACT NO

		DATE
MFG. APPD		DATE
ENGR APPD		DATE
DRAWN		DATE

MATERIAL: See Above
FINISH: See Above

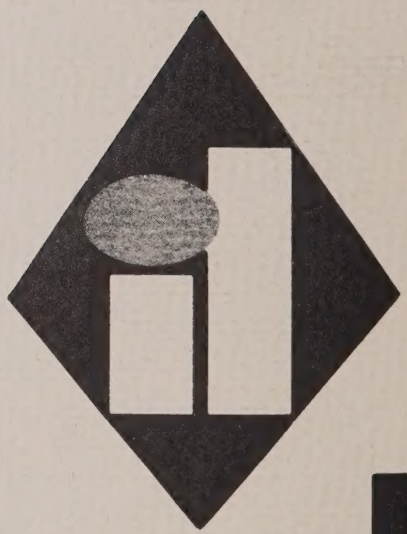
SCALE 2:1

International light INC.
12 UNICORN STREET, NEWBURYPORT, MASSACHUSETTS 01950

IL700 Power Board Layout Bd. #4

SIZE	DRAWING NO.	REV.
B	1575	A

DO NOT SCALE THIS DRAWING — SHEET



international light

DEXTER INDUSTRIAL GREEN, NEWBURYPORT, MASS. 01950 ■ TEL. 617 465-5923

MP MASTER
MA28467